State of Hawai'i
IMT

Benchmarking Final Report

Under Contract Number Z991503, Deliverables a.6.3, a.6.4, and a.6.5

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EXECUTIVE SYNOPSIS OF THE REPORT

SAIC conducted research to benchmark key attributes of IT service provisioning, governance and management, and technologies across the industry in general and focused upon state governments specifically. The benchmarking exercise provided insight into how other states and industry as a whole are performing IT – delivering services, charging for services, and measuring outcomes, and creates an external measurement basis for service delivery within the State of Hawai`i.

Like Federal, local and private sectors, state government organizations continue to experience fiscal pressure from the lingering recession. The May 2011 National Association of State Budget Officers (NASBO) fiscal survey of state governments found that state general fund expenditures remain below pre-recession levels and the Center on Budget and Policy Priorities reported that states' overall budget shortfall for 2011 may be as high as $119 billion.[i] [ii]

Since, forty-nine of the fifty state constitutions require a balanced budget and the recession has exacerbated states' ability to accurately predict revenues at the beginning of each fiscal year, 23 states have had to implement mid-year budget cuts during 2011 and six states enacted mid-year tax and fee increases.[iii] [iv] In spite of budget cuts, the fallout from the recession has tended to *increase* the state workload as more citizens seek aid from state agencies. Additionally, the federal Patient Protection and Affordable Care Act (PPACA) has put additional pressure on states, expanding the user base of the Medicaid program managed by states (with no accompanying federal aid to support additional administration costs) and requiring the launch of state-based Health Insurance Exchanges by January 1, 2014.[v]

In the state IT space specifically, the National Association of State Chief Information Officers' (NASCIO) 2010 survey revealed that state leaders expect two-thirds of state IT budgets to be reduced during the 2011-2013 period.[vi] Nearly two-thirds of CIOs anticipate having to reduce IT staff in the future.[vii] Due to this fiscal pressure, state IT organizations must justify costs and, now more than ever, position themselves as key business partners and creators of business value rather than as expensive overhead cost centers.

Figure 1: Predicted IT Budget Changes

CIOs' predictions on IT budget changes for 2011–2013

- Decrease **64%**
- Increase **13%**
- Remain the same **23%**

Some view this fiscal pressure as a positive force that can drive needed but sometimes painful performance improvements. The NASCIO believes the "new fiscal pressure is actually working to

help break down historical barriers to inter-agency[1] collaboration and partnering, sharing services, and pooling of resources."[viii]

In alignment with these pressures, consolidation/optimization was identified by state CIOs as the highest priority management focus area among state government technology organizations in 2011.[ix]   All twenty of the states analyzed in this benchmark exercise have implemented or are engaged in implementing some level of consolidation/integration/optimization. Additionally, 50% of the states analyzed have completed or are planning a data center consolidation project. And 50% of the states analyzed have adopted the NASCIO recommended National Information Exchange Model (NIEM) data standard. These efforts have resulted in cost savings as high as $14 million annually.

> One CIO, in response to NASCIO's 2010 annual survey stated that "The size of the IT portfolio increases, but the budget decreases; this has not been easy at all. The budget situation has provided us with a crisis, but because of that we are breaking through barriers that we would have never even been able to approach. We're doing amazing stuff, and some of our crossboundary stuff is really fantastic." Another indicated that, "We are making better decisions by looking at total cost of ownership. We are now looking at having agencies share applications across boundaries, instead of building them multiple times."

The majority of states analyzed which successfully completed consolidation efforts found that executive or legislative mandates, direct communication channels, governing committees representative of all stakeholders and specific agreements with each agency upon which subsequent reporting was based were vital to prevent 'cyclical' consolidation efforts (i.e., the CIO's organization consolidating servers and agencies coming right behind and re-installing agency-based servers). Forty-five percent of states analyzed have established a formal Customer Relation Manager (CRM) role in their central IT organization tasked specifically with serving as the interface point between agency leadership and the IT organization. To further support customer focus, 60% of the states analyzed have selected IT Infrastructure Library (ITIL) as the framework of choice for structuring their service management model. Since the response of states to fiscal and other pressures centers on collaboration and consolidation initiatives, it comes as no surprise that the IT management strategy with the highest adoption rate among IT organizations as reported by Computer Economics is the establishment of an IT Steering Committee.

In the midst of these consolidation efforts, a couple of new trends have emerged in state IT funding and purchasing. Several states are pursuing alternative funding sources for IT projects (e.g., self-funded web portals, etc.) and states are also finding ways to leverage the power of collaborative purchasing.

'Nuts and bolts' technology projects are also focused on consolidation/optimization. Virtualization and cloud computing lead as the top technology focus areas among state IT organizations. Seventeen of the twenty states analyzed (85%) have implemented or are pursuing the implementation of server and/or desktop virtualization, many as a best practice first step toward provisioning a cloud solution. Thirteen of the twenty states (65%) are actively pursuing a cloud solution. Thirteen percent of states responding to the annual 2010 NASCIO survey reported that

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[1] Agency is synonymous with Department for the State of Hawai`i.

that they were undertaking a cloud computing pilot.[x] Cloud computing is not without its challenges. Based on two studies completed in 2010 and 2011 by the Ponemon Institute, the majority of cloud providers who participated see security as their customers' responsibility and most did not have dedicated security personnel on staff. [xi] Aware of some of these pitfalls, states analyzed in this benchmarking effort prefer a hybrid solution versus a strict private or public environment. Other emerging technology areas include the use of social media and mobile computing. The emergence of social media (e.g., YouTube, Twitter, Facebook) as viable communication tools in the state environment has leapt ahead of most states' ability to develop sound usage policies. Ninety-five percent of the twenty states analyzed in this study use social media tools. Approximately one half of state CIO organizations and about 67% of other state agencies reported actively using social media tools in NASCIO's 2010 survey. As of 2010, only about one fourth of states had developed a statewide policy to govern social media use and some state attorney generals have prohibited the use of certain types of social media based on legal concerns.[xii] Mobile computing is another technology area growing almost faster than state policy and support frameworks can accommodate. Eighty-five percent of the states analyzed have implemented mobile applications; the most frequent mobile solutions provide access to the state web site; motor vehicle applications are the second most frequent.

In addition to fiscal pressure, the "graying" of the state IT workforce looms large on the 3-8 year horizon for most states. Approximately one fourth of state CIOs predict that up to 30% of state IT employees are approaching retirement within the next five years.[xiii] This represents an inherit drain of institutional knowledge particularly of antiquated systems and applications and poses a significant risk to the ability to maintain legacy systems. While states have been given a temporary reprieve due to some employees choosing to work beyond retirement age because of the recession, this is only a temporary fix. As a result, some states are including application portfolio management and modernization as a core focus of their consolidation/centralization initiatives and utilizing multiple technology strategies to update these systems including Enterprise Architecture Integration (EAI), Service Oriented Architecture (SOA), data conversion, virtualization, COTS replacement and application wrapping.[xiv]

1.0 INTRODUCTION

The purpose of the Benchmarking Final Report is to describe the results of the benchmarking research conducted in accordance with the *Benchmarking Strategy and Plan* delivered August 10, 2011. This document fulfills the project deliverables: a.6.3., a.6.4., and a.6.5.. (Note: State of Hawai`i of comparisons to benchmark data were captured in the *Final Report –Baseline of Information Management and Technology and Comprehensive View of State Services*.)

SAIC researched benchmark data from the twenty state organizations identified in Table 1 below.

Table 1: States Benchmarked

Benchmark State Organizations					
Hawai`i : population = *1,360,301*; square miles = *10,931*					
State	**Population**	**Square miles**	**State**	**Population**	**Square miles**
Alabama	4,779,736	52,419.02	Montana	989,415	147,042.40
Arizona	6,392,017	113998.3	North Carolina	9,535,483	53,818.51
Arkansas	2,915,918	53,178.62	North Dakota	672,591	70,699.79
Colorado	5,029,196	104093.57	Oregon	3,831,074	98,386
Florida	18,801,310	65,754.59	South Dakota	814,180	77,116.49
Indiana	6,483,802	36,417.73	Utah	2,763,885	84,898.83
Kentucky	4,339,367	40,409.02	Virginia	800,1024	42,774.20
Maine	1,328,361	35,384.65	Washington	6,724,540	71299.64
Michigan	9,883,640	96,716.11	West Virginia	1,852,994	24,229.76
Missouri	5,988,927	69704.31	Wisconsin	5,686,986	65,497.82

In addition to these state organizations, SAIC researched benchmarks and best practices from other environments (e.g., industry (as applicable); Gartner; Corporate Executive Board (CEB); Grant Thornton; Weill & Broadbent, National Association of State Chief Information Officers (NASCIO), etc.) with specific focus on state government management and functionality.

2.0   DETAILED BENCHMARKING RESULTS

Benchmark results are categorized as follows: IT governance/management benchmarks and technology benchmarks. Some of the benchmark results highlight or illustrate best practices or processes that have the potential to be 'quick wins' for State of Hawai`i. These findings are specifically designated with the following notations:

> **_BP_** = best practice

> **_QW_** = potential for a quick win in State of Hawai`i

2.1   IT Governance and Management Benchmarks

SAIC researched several components of IT governance and management best practices including areas of priority focus, consolidation trends among state government IT organizations, management organizational structures, funding/budget levels, staffing ratios, customer management processes, technology standardization, and implementation of process frameworks (e.g., ITIL).

2.1.1   Priorities

Finding 1: Consolidation/optimization heads the list as the top management priority for state CIOs.

NASCIO annually surveys state IT leaders to identify top management and technology areas of focus. See the table below for the top ten *management* focus areas for 2011. (See Section 3.3.1 for the top ten *technology* focus areas.)[xv]

Table 2: Top Management Priorities for 2011

State CIO Top Ten Management Focus Areas for 2011 (NASCIO)
1. Consolidation/Optimization
2. Budget and Cost Control
3. Health Care
4. Cloud Computing
5. Shared Services
6. Governance
7. Security
8. Broadband and Connectivity
9. Legacy modernization
10. Data and Information Management

Finding 2: Steering and change control head the list as the most mature management practices.

Computer Economics' 2010-2011 annual survey of 200 IT organizations identifies the adoption level of 14 key IT management processes across the industry. See the figure below.[xvi]

Figure 2: Mature IT Management Processes
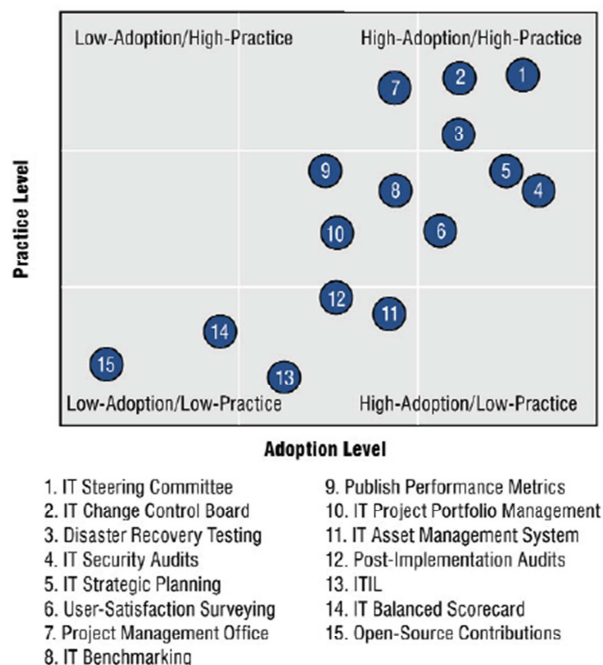
Source: Computer Economics, 2011

Figure 1

2.1.2   Consolidation Trends

Finding 3: Consolidation/integration/standardization are being considered or implemented by all states analyzed to achieve cost savings and improve performance.

- **Four of the twenty (20%) states analyzed have all IT staff and services consolidated under the leadership of a state CIO.**

- **The remaining sixteen (80%) have some services managed by the 'central' IT organization (typically shared services or enterprise-wide services) and some services (typically application development) managed within each agency.**

In 2010 the CIO of Iowa conducted a survey of other states' consolidation efforts identifying the areas of most frequent focus.[xvii] The results are presented in the figure below. In alignment with the findings among the twenty states analyzed in this study, Iowa's survey results highlight the fact that enterprise infrastructure services (e.g., email, hosting, network, etc.) are the service areas most organizations tap first for consolidation/ centralization.

Figure 3: Areas of Consolidation in the States

Consolidation Initiatives	Percentage of states that have or are consolidating	Number of states that have or are consolidating	Percentage of states that have not consolidated	Number of states that have not consolidated
Mainframes	82%	27	18%	6
E-mail/Messaging	76%	25	24%	8
Data Centers	70%	23	30%	10
IT Contracting	70%	23	30%	10
Servers	67%	22	33%	11
Cell/PDA Wireless	64%	21	36%	12
Networks (Both LAN/WAN)	58%	19	42%	14
Infrastructure Help Desks	58%	19	42%	14
Print Shops	48%	16	52%	17
Data Storage Retrieval and Backup	42%	17	58%	16
Application Integration	39%	13	61%	20
Desktop, Laptops, Thin Clients	36%	12	64%	21
Document Management	33%	11	67%	22

Source: State of Iowa National Consolidation Survey 2010

Finding 4: [BP] **Enterprise-wide technology consolidation initiatives (e.g., email transitions, etc.) are more successful when the following best practice management processes are adhered to: 1) initiate via executive order or legislative mandate, 2) establish a steering committee comprised of representatives from across the enterprise, 3) develop and document the business case, 4) establish written agreements with each participating agency (customer) defining their specific requirements and tie performance metrics to these requirements, 5) publish and report on a schedule of transition, 6) meet weekly with agencies in transition, 7) centralize staff in phases (i.e., one agency or one function at a time), and 8) standardize and assess before consolidation.**

Alabama: Alabama's email consolidation project was initiated by executive order in 2005. Fifty plus unique systems were to be centralized into one system within 18 months. As of May 2011, 45 of the 50+ systems were consolidated. Among others, the Alabama Department of Transportation 'won the battle' to retain their own system. Alabama's Information Systems Division (ISD) also found that during other server/system consolidation efforts, agencies came behind and began deploying their own servers which ISD is now working to consolidate.[xviii]

> "CIOs should conduct assessments so they can show that better service can be provided at a lower cost [the business case]. 'It's one thing to sit and argue from an emotional standpoint, but when you have the facts in front of you, it's somewhat difficult to argue with that.'"
> *George White, State of Pennsylvania CIO*

Michigan: By centralizing IT staff prior to standardization (DIT went back during the first year post centralization and focused on process re-engineering), Michigan's Department of Information Technology (DIT) created unnecessary obstacles that had to be overcome down the road including:

- "Informal processes -- … we had very informal operating processes. Not much written down, no data on service levels …. Server folks in Human Services, didn't know how to work with server folks at State Police. They never had to do that before. And now we were asking them to work together for a consistent level of service, but we had nothing to hand them, to tell them how to do this. Even today I have people who are doing the same job, but they are at different levels depending on what agency they worked for, and how literal or how strict those personnel policies were. And that is a huge source of dissatisfaction."

> Achieving state enterprise-wide IT management typically includes five steps:
> - Legislation
> - Strategic Plan/Mission
> - Standards and Enterprise Architecture
> - Implementation (services/data center one of the first areas)
> - Performance review
> *(http://www.statetechmag.com/issues/summer-2005/legislating-it-consolidation.html)*

- "Underestimated employee and agency and legislative resistance -- We underestimated employee resistance. We did a lot of talking about getting to cross-training, you'll have a career path between agencies, but we underestimated the amount of communication we needed to do. And we underestimated the agency resistance. I have agencies today that are working the Legislature about what's wrong with what I'm doing. So we ended up having to go back in and get the leadership to agree that this was a good idea. We did not put the kind of lobbying in place that we needed to."

- "We proceeded without an adequate funding model – It had a lot of holes in it … we spent [the] first year, sorting the mechanisms so agencies could see what they were getting for their money. People say 'I'm paying this bill each month, what am I getting for it?' They didn't know how much they were paying before, but when it came to paying that to another agency, it was a totally different dynamic."

- "We centralized our technical staff too quickly – That was very true of the desktop staff that service outside the Lansing area. We had a wide variety of technical platforms. …. You can imagine that when a tech goes out in the field, doesn't necessarily now what the technical environment is in the State Prison, they are not going to give service so quickly so it causes service level problems."

- "We had an inexperienced executive team -- Because of the personnel rating system, we had individuals who went from having 10 people to having 80 people. And there was really no mechanism to teach them how to deal with that broader team. Many of those folks were technical people who had risen through the ranks. They never really wanted to manage people in the first place. It was a way to advance their careers. And now had to manage 80 people through a very difficult time." [xix]

Colorado: Colorado's consolidation effort focused on people, processes and technology. To align the people component, they conducted an assessment of IT staff (skills assessment),

allowing them to "functionally align the staff" to support both agency lines of business and enterprise service requirements.[xx]

Detailed overviews of consolidation/centralization initiatives within Indiana, West Virginia, Michigan and Utah are provided in Appendix A.

Finding 5: [BP] **Ten of the twenty states analyzed (50%) have or are planning/implementing a data center consolidation solution.**

Per the NASCIO 2010 State CIO Survey, 27% of state CIO's anticipated building new data centers within three years and 16% anticipated down-sizing state data centers (many due to consolidation initiatives.)[xxi]

Michigan: Since 2004, Michigan's Department of Technology, Management & Budget (DTMB) has migrated 36 computer rooms into three data centers. This effort improved the security, reliability, manageability and availability of critical systems, saved the state $19+ million and freed up office space (30,000 square feet).[xxii] Michigan is currently assessing the viability of a public-private partnership to replace two of the existing three data centers. This partnership would engage the private sector, local governments and higher education institutions in a joint solution and take advantage of an emerging trend among state government IT organizations to 'look beyond their borders' for opportunities to collaborate for greater efficiencies and buying power.

> "Agencies have 'closet data' centers and are concerned about losing resources and control. To get the agencies to come out of their boxes, we are planning communities of interest around data center virtualization. There would be communities of interest for public safety, economic, commerce, etc. and we would group agencies into communities of interest that deal with similar information. We can do this at the network, security and server administration level, but not yet at the application development level." *CIO participant in the NASCIO 2010 State CIO Survey*

Florida: Currently Florida operates three disparate primary data centers (each of which operates based upon a unique service offering and rate structure) and multiple agency data centers. The legislature has mandated that the Agency for Enterprise Information Technology (AEIT) identify two agency center consolidation candidates per year for the Governor and legislature.[xxiii] Florida's AEIT Advisory Committee was established to focus specifically on a Statewide Email and Data Center Consolidation initiative. This committee reports to the CIO Council. As part of this initiative, an inventory template was created and distributed to each agency for completion. Agencies were also tasked with developing and submitting a transition plan for relocating computing services to a data center. To help facilitate these agency tasks, a representative from AEIT met weekly with each agency.[xxiv] For more information about this effort and for copies of agency transition plans visit https://aeit.myflorida.com/datacenterconsolidation.

2.1.3 Funding/Budget

Tracking total, state-wide technology expenditures remains very difficult as most states do not yet track IT spend as a distinct line item within the normal state budget process. Some states (Wyoming, North Carolina) are creating IT expenditure reports (typically from within the CIO office) to provide a state-wide picture of IT spend. As states consolidate, centralize and standardize

IT services, tracking state-wide IT expenditures will become easier allowing for greater comparison. The following findings were based on the limited data available from the states analyzed at this time and from industry norms. (Note: Benchmarks were pulled from states in which total IT spend was readily available. To obtain adequate data for these benchmarks, Georgia and Wyoming were included in the list of states assessed for this section only.)

Finding 6: IT operational spend per employee per year averaged approximately $8,400.

Finding 7: IT spend (managed by the state's IT organization) totaled an average of .5% of total state spend.

Finding 8: IT spend (total state-wide spend) averaged 2.75-3.0% of total state spend.[2]

Finding 9: IT staff (total state-wide) to end user ratios averaged 25-30:1.

Finding 10: Several states have implemented or are planning to implement some level of portfolio management process.

IT portfolio management is becoming more prevalent within state government organizations. Six of the twenty states (30%) apply some level of portfolio management to IT decisions and six of the twenty states (30%) have an online portfolio management tool. Nationwide, 50% of state CIO's indicated in the NASCIO 2010 State CIO Survey that they use a formal IT portfolio management

> "Agencies actually will stop projects when they are forced to put them on the portfolio and they are vetted through the leadership. ...With visibility and clear expectations, the system becomes self-policing." *CIO Respondent to the 2010 State CIO Survey*

process. While most states' IT management processes appear to designate IT projects as 'operational' or 'capital' projects, it is not clear that these designations equate to the federal 'steady state' and 'development, modernization and enhancement' categorizations used in the more mature federal IT portfolio management framework. [xxv]

Finding 11: At least sixteen of the twenty states (80%) analyzed have established charge back/cost recovery for shared services.

West Virginia: During West Virginia's consolidations and centralization initiative, the Office of Technology (OT) established a shared services billing process. OT's billing methodology for core, non-optional services is based on the number of units deployed (total cost divided by total number of units) by an agency. Optional services are billed based on utilization. It is of note that OT found some agencies' total costs *increased* despite a state-wide IT cost *decrease*; this increase was due to the shared services billing process resulting in a more equitable distribution of service charges/costs to each agency.

Finding 12: *QW* States are achieving significant cost savings via IT procurement. States are also finding that giving non-state entities (local governments, educational institutions) and peer states, access to state government purchasing contracts greatly increases state buying power.

Florida: In FY 2010-2011, Florida's Agency for Enterprise Information Technology (AEIT) began moving toward enterprise IT procurement via analysis of existing contracts and

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[2] For 2010, a 6.5% government IT spend to total government expenditures (not limited to State government) was reported by one surveyor.

identification of areas where potential economies of scale could be achieved. Also, AEIT provided Florida's Department of Management Services (DMS) with contract language compliant with state technology standards which allows non-state government entities to purchase technology resources using Florida's existing contracts.[xxvi]

Montana: The State Information Technology Services Division (SITSD) renegotiated state-wide cell phone contracts in November 2010 for a savings of $250K annually.[xxvii]

Indiana: The Indiana Office of Technology (IOT) approves all technology purchases. Savings have been achieved via consolidating multiple contracts into enterprise-wide agreements and re-negotiating contracts based on new standards, larger quantities, etc. One example, IOT negotiated a state-wide cell phone plan into an agreement that mimics the popular, private 'family plans'; this new arrangement saved the state $1 million.[xxviii]

West Virginia: The Office of Technology began rebidding statewide IT contracts to leverage volume pricing in 2006. West Virginia's first enterprise personal computer contract reduced the average cost of a PC 47%; the statewide cell phone contract reduced charges by 19%; and the statewide telecommunication data circuit contract reduced the average cost of a MB by 65% over five years.[xxix]

Multi-state alliances: The Multi-State Information Sharing and Analysis Center (MS-ISAC) is working with state and local governments to research how to easily leverage the collective buying power of multi-state procurements. In 2011, Florida's AEIT provided MS-ISAC with recommended contract language and statutory language that would make this process easier.[xxx]

The Western States Contracting Alliance (WSCA), another multi-state cooperative of which the State of Hawai`i is a member, has allowed member states to leverage collaborative buying power in the technology sector as well. Aware that state government organizations have access to GIS services via the Federal General Services Administration (GSA) Schedule 70 contract, that cloud services would be added the Schedule 70 at some undetermined date, and that each state's discount via the Schedule 70 was based solely on the volume purchased by that state rather than the combined volume of all states[xxxi], Montana, Oregon, Utah and Colorado joined together to jointly solicit information about public, cloud-based GIS solutions. The WSCA formally released the RFI for this consortium.[xxxii]

Non-state alliances: Ancillary to consolidation of state resources is the emerging trend among state government organizations to 'look beyond their borders' for opportunities to collaborate and partner with private sector organizations, local governments and higher education institutions to achieve greater efficiencies and purchasing power. **BP** Indiana's Office of Technology (IOT) extended the right to use state contracts to local governments and schools achieving a stronger bulk purchasing position for all participants. Approximately two-thirds of the personal computers purchased on IOT's contract with Dell are made by local governments.)[xxxiii]

The figure below provides state CIO responses regarding organizations willing to participate in shared service initiatives. These responses were provided as part of NASCIO's 2010 State CIO Survey.

Figure 4: Organizations Willing to Participate in Collaboration Initiatives

Organization	Percentage
Other state executive branch agencies	84
K-12 schools and school districts	66
Community colleges	53
State colleges and universities	53
Special districts	37
Other state judicial branch agencies	34
Other state legislative branch agencies	32
Counties	8
Other	5

Finding 13: Many states are pursuing alternative funding options to mitigate reductions in general fund appropriations.

In response to fiscal pressure, states are pursuing alternative funding sources for IT projects. The figure below defines the primary reasons states chose to pursue innovative funding sources. These responses were provided as part of NASCIO's 2008 survey of innovative funding for state IT.[xxxiv]

Figure 5: Primary State Motivations for Pursuing Innovative Funding Sources
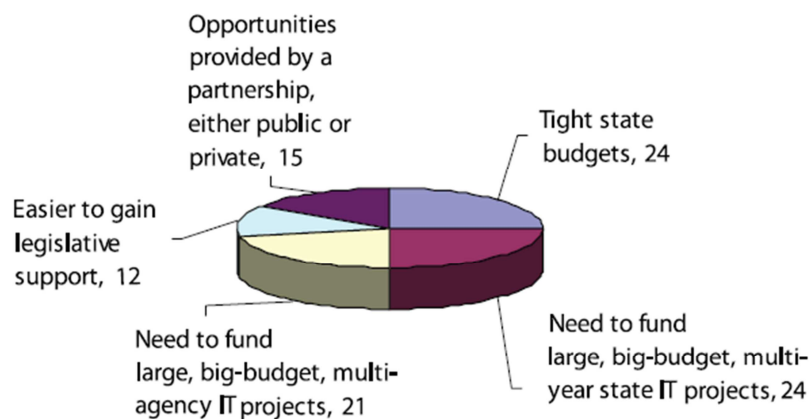
The implementation of self-funded state government portals began in the 1990's; with the increased fiscal pressure due to the recession, this trend has grown over the past decade. Currently, at least twenty states, including Hawai`i, have implemented the self-funded web-portal model, delivering efficient services without expending appropriated funds. In addition to user-fee revenue, other alternative IT funding strategies pursued by states include grant funding (private and public grants), retaining technology funds that remain unspent at the end of a given fiscal year, reallocating project savings to fund upcoming projects, issuing project bonds through the state's bonding authority, benefits funding (i.e., fund the project

through additional revenues generated by the project upon implementation), selling bulk data to private entities, public-private partnerships and public-public partnerships.[xxxv]

2.1.4   Organizational Structure/Approach

Finding 14: In at least seven of the twenty (35%) states analyzed, the CIO reports directly to the Governor.

While establishment of a state-level CIO position has been designated in most states, only about 35% have been given the authority to approve IT agency budgets, effectively limiting their true power to that of a 'paper tiger'.[xxxvi]   Currently, many CIO's rely on personal relationships with agency leaders to achieve mandated objectives.   To be effective, NASCIO recommends that governors and legislatures vest CIOs with authority to participate in the agency-IT budget process, review all state-funded IT purchases, and oversee a state-wide portfolio management process.[xxxvii] Several states are moving toward centralizing technology authority. Utah found this level of executive power to be paramount to successful consolidation and centralization efforts.[xxxviii]

Finding 15: [BP] Eighteen of the twenty states analyzed (90%) have established an oversight/governance committee to support the CIO.

This finding is alignment with an industry wide finding by Computer Economics that establishment of an IT Steering Committee is one of the most widely adopted IT management practices.[xxxix]   At least twelve of the twenty (60%) states analyzed have tasked their oversight committee(s) with development of an enterprise architecture.   Several states have also established additional advisory committees/ workgroups which report to the CIO and/or an overarching council; these additional workgroups typically have a focused scope (e.g., researching, planning and managing an email consolidation initiative, etc.)

Utah: [BP] The DTS Transition Advisory Council (DTAC), comprised of senior managers and several agency IT Service Directors, works with agencies to ensure business needs are met and present/review optimization opportunities via the established IT investment review process. A Technology Advisory Board, comprised of private sector, educational and government members also provides guidance.

Finding 16: IT organizations in the midst of centralization/consolidation have found a variety of ways to address staffing challenges.

Both unionized and non-union states have pursued consolidation/centralization initiatives. In 2010 the CIO of Iowa conducted a survey of other states' consolidation efforts. Specific to HR, survey results revealed that fifty percent of respondents involved in consolidation dealt with collective bargaining issues. "Most states with unions did not report an issue with consolidation of human resources. One state related that an agency used union-like protection to avoid consolidation - specifically, employees could petition a board if they were terminated from their positions. Most states did move some personnel out of the agency and into the centralized structure. However, some people remained in the agencies to support geographical areas or specific applications. During consolidations, agency IT personnel interviewed for jobs in the consolidated IT model. Few states utilized a formal skills

assessment as an approach to consolidating human resources. Funding and location were not typically discussed as most IT funding remained with the agency and a charge back model was used to account for central IT employee salaries. … 75% of states with collective bargaining indicated they had no union issues but did standardize job classifications to create parity with others performing the same duties and skills as a result of the consolidation. 25% of states with collective bargaining worked with union leaders to insure the member status would not change as long as the union members remained with the state. One respondent did note that his state allowed certain job classifications to be used only by the central IT organization and not by other state agencies as a result of the consolidation. … 12.7% of states plan on using an IT skill assessment but have not identified an assessment tool. 25% of states used an interview process to fill positions as a result of consolidation." [xl]

Several organizations have met resistance when centralizing IT staff. To address this resistance, one organization offered two weeks of training in the technology area each staff person was most interested in.[xli] Utah's Department of Technology Services (DTS) offered employees an incentivized option to voluntarily transition from "merit" status to "at will" status; 91% took the option. [xlii]

Finding 17: The cloud skill set is expected to be primarily managerial.

> "We call the shift the movement from blue-collar IT to white-collar IT. The cloud is accelerating that movement of technology into the business, with business-process-level expertise becoming more important than ever." *Ted Schadler, Forrester*

As state government organizations transition to cloud-based solutions, the IT staff landscape is expected to change as well. Based on research conducted by Computer Economics, the manager-to-staff ratio within IT organizations is typically around 11%; industry experts expect that to increase as cloud and increased automation initiate the transition of IT staff from staff managers to resource managers, from technical management to business management.

Gartner expects two cloud management roles to emerge:
- cloud leads/cloud czars – responsible for strategically merging the cloud to business needs
- cloud administrators – former network/storage administrators responsible for managing the relationships with providers

> "You are going to have to configure the network firewall and determine how much storage you will need and communicate with the vendor, but that will be the same guy. No more separation to roles by IT function." *Drue Reeves, Gartner*

Along these lines, Gartner also expects the responsibilities of traditional operations staff to evolve from technical specialist to "jack of all trades". [xliii]

Finding 18: The Project Management Office (PMO) is becoming a key tool for implementing enterprise-wide policies within new projects.

Some states are using the PMO to ensure large projects are addressed from an enterprise-wide perspective. One CIO participant in NASCIO's 2010 State CIO Survey indicated that "We don't do large projects unless we have dedicated project management offices (PMOs). Our PMO brings three components together: people (training, skill sets), processes (how they used to work, how they work today) and technology. For large projects, we ask for a

fully dedicated senior person to own the people side --- if we don't get this, we don't do the project." [xliv]

2.1.5   Customer Focus

Finding 19: Seven of the twenty states (35%) clearly indicated that they proactively measure customer satisfaction.

West Virginia: Two years into an enterprise-wide consolidation and centralization effort, West Virginia's OT began surveying customers. Currently 49% of employees who generate a support ticket are surveyed. Less than positive responses are reviewed to inform continuous improvement efforts.
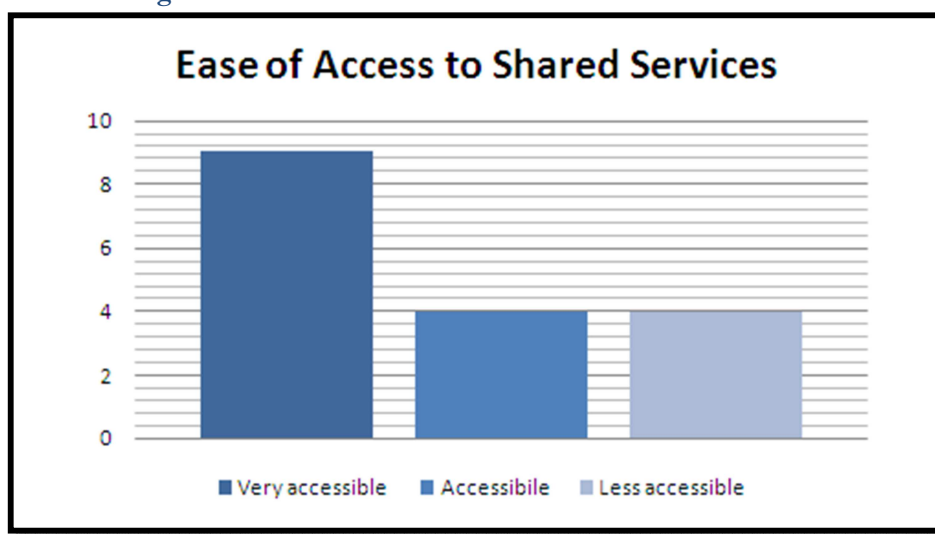
Finding 20: Eight of the twenty states analyzed (90%) have a published Service Catalog.

Service catalogs that present services from a business perspective typically provide the most customer focused format. States have used several techniques to achieve this business perspective including 'bundling' services by business need rather than simply listing services a la carte, clearly delineating prerequisites for specific deployments, etc. The Indiana Office of Technology's [Service Catalog]() includes a "Basic SEAT Bundled Services" offering. This rate includes all the standard services needed to provision basic computing including hardware, software, support, printing, network access, email, file storage and security services. These are the services most frequently purchased; by bundling, agencies are able to order the complete suite of services required to get a typical Indiana employee connected and functioning without having to place and track multiple orders.

Finding 21: Access to shared services in nine of the twenty states analyzed (45%) was judged as 'very accessible' based on ease of access to the Service Catalog, thoroughness and clarity of the service descriptions, etc.

The figure below provides an overview of the assessment of the accessibility of shared services in benchmarked states.

Figure 6: Ease of Access to Shared Services in the States

Finding 22: **BP** **At least nine of the twenty states analyzed (45%) have established a formal account manager/Customer Relationship Manager (CRM) role within the central IT organization to interface between the IT organization and agencies across the state.**

West Virginia: Office of Technology Relationship Managers are designated as the single point of contact for agency staff at the executive and cabinet levels. They are responsible for understanding customer needs and keeping customers up to date on changes to OT services. Relationship managers meet monthly with various agency leadership to discuss service performance and upcoming changes.

Finding 23: Twelve of the twenty states analyzed (60%) have implemented or are implementing the ITIL ITSM framework.

A few states (Virginia, Oregon, Utah, and North Carolina) have implemented at least seven ITIL management functions.

Finding 24: Ten of the twenty states analyzed (50%) have developed service level agreements (SLAs).

Establishment of service level agreements between central IT service organizations and state agency customers is vital to the success of consolidation/optimization initiatives. SLA's help mitigate the belief among agency customers that consolidation/centralization initiatives equate to a loss of control by setting mutually agreed up on performance expectations that both meet customer needs and are realistically achievable by IT organizations. Nationwide, the NASCIO 2010 State CIO Survey indicated that only 24% of CIOs manage to performance levels defined in SLAs. While this is low, many indicated that performance management is now being mandated by state legislatures. SLAs can be based on cost, availability and other performance measures. The figure below provides state CIO responses regarding types of measures typically included in a SLA. These responses were provided as part of NASCIO's 2010 State CIO Survey.

Figure 7: SLA Measurement Types

Performance measure	Percentage
Performance attaining service-level targets	71
Customer satisfaction	59
Cost	56
Benchmark comparisons	38
No metrics used to measure and manage service levels	15
Reliability and availability	3
Do not know	3

2.1.6   Security and Privacy

Finding 25: Security and privacy management is becoming more important as states use web interfaces to provide services to citizens.

States capture and maintain a wealth of personally identifiable information (PII) and other sensitive data. With more state government-to-citizen services being offered online and more states embracing social media communication tools, security risks for state governments are growing exponentially.

To address these risks many states (92%) have designated an Enterprise Chief Information Security Officer (CISO) tasked with developing security standards, providing security training, and offering other governance guidance.   Eighteen percent have designated a Chief Privacy Officer (CPO) responsible for assessing the management of privacy data across the state enterprise (executive branch). Fifty-five percent of states have documented and approved information security strategies; the majority (90%) prefers the National Institute of Standards and Technology (NIST) framework. Ninety-two percent of states have laws in place guiding the definition and use of sensitive information. Most states (80%) have fully deployed antivirus, firewall, IDS/IPS solutions.

> "A scan of public data loss notification websites indicates that more than one-fifth of reported data breaches in 2009 occurred in the state and local government sectors." *NASCIO 2010 Cybersecurity Survey*

While these initiatives represent a vast improvement over state security management maturity levels of just a few years ago, only 45% of states are 'somewhat confident' of their ability to protect assets from external attack.[xlv]   Additionally, only 43% of state CISO's have jurisdiction over information security budgets and most state security budgets are limited, ranging from 1-3% of the total technology budget. States also lack a nation-wide governing body (such as FISMA) and most CISO's report performance to the CIO rather than to both the CIO and the legislature, governor or state attorney general. This limits adherence to security policies. [xlvi]

2.2   Technology Benchmarks

SAIC's technology benchmark research focused on enterprise approaches to several key technologies.

2.2.1   Priorities

> **Finding 26: Virtualization and cloud computing top the list as technology priorities among state government IT organizations.**
>
> NASCIO annually surveys state IT leaders to identify top management and technology areas of focus. See the table below for the top ten *technology* focus areas for 2011. (See Section 3.1.1 for the top ten *management* focus areas.)

Table 3: Top Technology Focus Areas for 2011

State CIO Top Ten Technology Focus Areas for 2011 (NASCIO)
1.   Virtualization
2.   Cloud computing
3.   Networking
4.   Legacy application modernization / renovation
5.   Identity and access management
6.   Document/Content/Records/E-mail management
7.   Security enhancement tools
8.   Business Intelligence (BI) and analytics applications
9.   Enterprise Resource Planning (ERP)
10.   Social media and networking

2.2.2   Enterprise Hosting and Infrastructure (Cloud Computing)

> **Finding 27: Virtualization of current assets has allowed states to reduce costs while meeting increasing demands and is a best practice first step to prepare for transitioning to a cloud computing environment.**
>
> *Michigan:* Michigan's Unemployment Agency began server virtualization in 2005, consolidating 23 physical servers onto 6 virtualized hosts. Based on best practice research (Gartner and Forrester), the agency selected VMware ESX as the enterprise standard. As other agencies joined the trend, multiple hardware/software versions were introduced. The lack of governance, technical standards, and trained support staff limited Michigan's ability to easily implement virtualization across the entire state enterprise. As a result, virtualization was limited to test and development initially and in 2007 Michigan's Division of Information Technology (MDIT) began efforts to standardize virtualization services; the Virtual Center of Excellence (VCoE) was established to develop and manage a state-wide server virtualization solution. To meet this demand, a cross functional team was tasked with

developing necessary collateral including a virtualization candidate assessment tool, virtualization infrastructure gap analysis and recommendation, detailed design and migration plan, support documents (processes, etc.), service rate (including infrastructure, training, enterprise license agreement, etc.), a pilot implementation plan, a strategy for future migrations, an assessment of project future demand, and a plan to ensure capacity stayed ahead of demand. Costs were minimized by shared core infrastructure, enterprise license agreement for health checks, licenses that could be used as needed and a matrixed support team from across MDIT. The VCoE found that the utilization of templates enabled the creation of virtual resources quickly. Michigan's 'virtual first' policy which requires the use of virtual servers where feasible and multiple informational meetings including a symposium for MDIT customers, accelerated the adoption of virtualization across the enterprise. The result is a virtualization platform that maximizes capacity, accelerates the implementation process, and monitors the ratio of physical to virtual. Today the VCoE:

- currently serves as a private cloud for virtualized systems in Michigan
- shortened the provisioning process by 69% (14 days instead of 45 days)
- provides Disaster Recovery via redundant data centers
- creates positive momentum for other goals and leads the way for best practices in managing other enterprise wide shared service initiatives such as document management, externally connected users, etc.
- limits server sprawl as applications are transitioned from mainframe to the client server environment
- significant cost savings (as of 2009 the first 160 virtual servers resulted in $22,400 month in savings; that figure was expected to double over the following six month period due to new requests).

The table below was developed by MDIT to illustrate the significant cost difference between virtualization and physical server technologies. Since virtualization is an 'economies of scale' technology, increased utilization typically decreases virtualization costs.[xlvii]

Table 4: Costs of Physical versus Virtual Servers

	Physical	Virtual
Technical Support	$475	$390
Hardware (Upfront \ Capital Expense)	$115 (48 month dep)	N/A
Network Connection (3 x $40)	$120	N/A
Housing Expenses (2U)	$30	N/A
SAN Ports (2 x $75)	$150	N/A
VM Infrastructure Rate*	N/A	$280
Monitoring	$130	$130
20 GB system disk	N/A	$80
Total Monthly per server	**$1,020**	**$880**
Total Monthly (125 servers)	**$127,500**	**$110,000**

MDIT calculated that by using virtual servers, charges to state agencies were reduced 16%, representing a $140 savings per month when compared to a physical server, and a $6,720 savings to the agency over the life of the server. When extrapolated out, an agency with 50 servers would save $336,000 over four years.

Finding 28: Seventeen of the twenty states analyzed (85%) are actively pursuing or have implemented some level of virtual services.

Within the virtualization space, states are achieving economies of scale (and associated cost savings) in both server and desktop virtualization.

Server virtualization: Due to the historically soloed structure of IT management within state governments, most states ended up with a significant state-wide investment in server hardware/software and a myriad of underutilized agency application servers. Server virtualization provides significant cost savings (both direct savings and cost avoidance) while allowing data owners some degree of privacy and customization of the virtual server space they utilize. While the greatest economies of scale are obviously achieved when server virtualization is managed by a central technology organization (i.e., state-wide data center), savings have also been realized by the implementation of virtualization within specific state agency environments.

Indiana: Indiana designated approximately 45% (669) of its installed server base as appropriate for consolidation and virtualization onto the Intel PowerEdge R900. This resulted in an 89% consolidation ratio and a savings of $4 million (hardware, cooling, network/storage equipment) over three years.[xlviii]

Desktop virtualization: While the majority of the states included in this study that are implementing virtualization are pursuing server virtualization, some states have also reaped similar benefits via desktop virtualization including reduced seat costs, efficient control of a centralized desktop infrastructure with simplified software deployment radically reducing rollout/upgrade costs, desktops personalized to the end user, full hardware utilization, longer equipment lifetimes, reduced power consumption, increased availability, increased flexibility, and license costs based on actual need. As noted below, Arizona has established a desktop virtualization center of excellence. Other states pursuing desktop virtualization include Michigan, which is planning to implement by 2014, and Montana, which has implemented 36 virtualized desktops in at least one agency primarily for telecommuters.

Finding 29: Establishing a center of excellence has helped states structure their virtualization implementation and gain buy-in across the enterprise.

As noted above, the center of excellence model was a core part of Michigan's virtualization and cloud solution. Arizona has also found this model effective.

Arizona: To socialize the benefits of desktop virtualization among state government agencies, Arizona's Department of Administration (DOA) partnered with industry leaders (Citrix, HP, Microsoft, Dell, IBM, Cisco, Intel, Qwest, Lenovo, AZNet, Avaya, Blackberry, Arizona State University) to establish the Virtual Government Technology Center (VGTC). Over twenty, no-cost-to-Arizona 'loaner' virtualized workstations (hardware and software including servers and switches) and support services such as architecture, design, deployment, and migration guidance were provided by industry partners. Arizona DOA provides office space, rack space, wiring, power and staff to lead tours. The VGTC serves as a lab providing a 'real live' demonstration of the Arizona desktop virtualization solution. Virtual workstations are set up representing a variety of Arizona state employee work environments (e.g., mobile, telecommute, task [customer service center]) and information regarding the

architecture and migration processes is provided. Arizona currently has approximately 9000 desktop virtualization licenses.

Finding 30: Thirteen of the twenty states studied (65%) are pursuing a cloud solution.

The benefits of cloud computing are myriad: advanced functionality, increased capacity, improved accessibility, standardized computing access between 'rich' and 'poor' agencies, and cost savings. But selecting a cloud solution is complex. Best practice cloud computing implementations tailor the solution (public vs. private, IaaS vs. SaaS) to the state's specific need.

> "The biggest issue is making sure that a state has a cloud computing strategy and framework. You don't want to open a cloud to the world without a framework." *CIO participant in the NASCIO 2010 State CIO Survey*

Public vs. Private: Of the thirteen states identified that are actively pursing cloud computing, the leading preference is for some form of a hybrid cloud environment that would allow the state to benefit from the scalability and low cost of public solutions for non-sensitive data/application needs and the security provided by a private cloud environment for hosting sensitive state data. This strategy aligns with industry-wide perspectives; in a survey of 100 businesses with a total of 347,448 users worldwide, the Radicati Group found that (at least in regards to email and collaboration services), most organizations lean toward a private (on-premises) hosting/cloud solution.[xlix]

A few state approaches to note:
- *Montana* – planning a private cloud with access to a public cloud for just-in-time delivery expansion capability during high load times.
- *Montana, Oregon, Utah and Colorado* – teamed up to release a single RFI soliciting information about public, cloud-based GIS solutions.
- *Colorado:* Consolidation began in 2008. Existing assets included 40 data centers with 1,800 servers (including 122 email servers hosting three types of email systems). The Office of Information Technology envisioned gaining the ability to share resources between seventeen state agencies and also with local jurisdictions and schools across the State. To accomplish this, Colorado decided to implement a hybrid cloud solution with three elements: a private cloud for line-of-business/highly secure data and systems, a virtual private cloud for archival storage/disaster recovery, and a public cloud for e-mail office productivity applications and websites. To quickly establish the private cloud, Colorado will overhaul an existing data center with server virtualization. Colorado's public cloud access was piloted in three agencies with access to Google Apps for e-mail and office productivity tools. Based on pilot results and final cost-benefit analysis, all 27,600 Executive Branch employees will be transitioned. (Early cost benefit analysis indicated the potential for $8 million in annual savings plus an additional $20 million in cost avoidance over three years.)[1]
- *Kentucky* – Department of Education switched 700,000 PK-12 users to Microsoft's Live@edu cloud service for email, communications, and collaboration for an expected savings of $6.3 million over the course of four years. The major

> "It (Microsoft's Live@edu cloud offering) allows us to do sophisticated things that our peers across the U.S. cannot do." *David Couch, CIO - Kentucky Department of Education*

transition (500,000 users) occurred over one weekend. [li]

- *Virginia:* In the 2009 the Virginia Information Technologies Agency (VITA) received requests to build and host new systems that were cost prohibitive. Instead, VITA implemented a virtualized software development platform. In addition to development, VITA now uses this cloud solution to scale the production up as needed and to capture disaster recovery backups. Time to stand up a new development environment went from months to less than two hours. VITA is also evaluating the potential of a cloud solution at the agency level. [lii]

- *Michigan:* Michigan's "MiCloud" initiative is seeking methods of provisioning services at a lower cost. Michigan already has a strategic investment in storage virtualization technologies which went live in 2010. Currently, Michigan is piloting MiCloud "Storage for Users" and "Storage for Servers" at a projected cost 90% lower than low-cost storage tier rates. Consumption expectations are 250+ terabytes in the first year. The MiCloud solution allows automated delivery within 10 minutes of online request submission. Michigan has also engaged in a proof-of-concept for the MiCloud "Hosting for Development" and "Process Orchestrator" functions is also looking at a hybrid solution to deliver Application Platform as a Service (APaaS). [liii]

- *Utah:* Utah decided to pursue a hybrid cloud solution as well. Utah has given access to these services to local governments across the state. Many services provided to the local sector are offered free of charge but Utah is also able to charge for other services (e.g., Force.com for Customer Relationship Management, Google Earth Professional for shared Geographic Information System (GIS) planning, and Wikispaces). Utah is developing a private cloud through server virtualization and eventually plans to extend virtualization to desktops across the state. [liv]

IaaS vs SaaS vs PaaS: Most of the states analyzed are pursuing IaaS or SaaS initially. Nine of the states offer or use SaaS.

- *Michigan* – Michigan began offering cloud-based storage and hosting services in April 2011. MDIT expects to deliver 80+ servers in the first year with automated, 30-minute-after-request delivery of virtual servers. MDIT also expects to implement Computing-as-a-Service during 2011 for private VM servers.

2.2.3 Enterprise Collaboration and Messaging (Broadcast, User Messaging, Social Media, Collaborative Workspaces)

Finding 31: Nineteen of the twenty states (95%) have implemented centralized or shared email services.

Oregon: Oregon is currently moving from 55 email systems to a centralized solution.

Florida: The Agency for Enterprise Information Technology (AEIT) is facilitating the transition to a new enterprise, outsourced email service in FY 2010-2011; tentative date for beginning of transition is October 2011 with expected completion December 2012. Expected savings for FY 2011-2012 are $735K and over the life of the seven year contract, $15 million. Input was solicited from agencies regarding draft standard for state email addresses (final rulemaking August – September 2011.) [lv]

Alabama: In 2005, Alabama's new governor tried to send an email to all state employees and could not due to the lack of a centralized email service. At the time, Alabama utilized over 50 unique email systems. Some agencies had multiple email servers installed. The governor issued an executive order and Alabama's IT organization was given 18 months to consolidate email services; as of May 2011, 45 of the 50+ email systems have been consolidated.[lvi]

Finding 32: Nineteen of the twenty states (95%) are using social media to enhance communications with state staff and citizens.

See the figure below for some social media tools implemented among the states analyzed.

Figure 8: Social Media Types Implemented by States
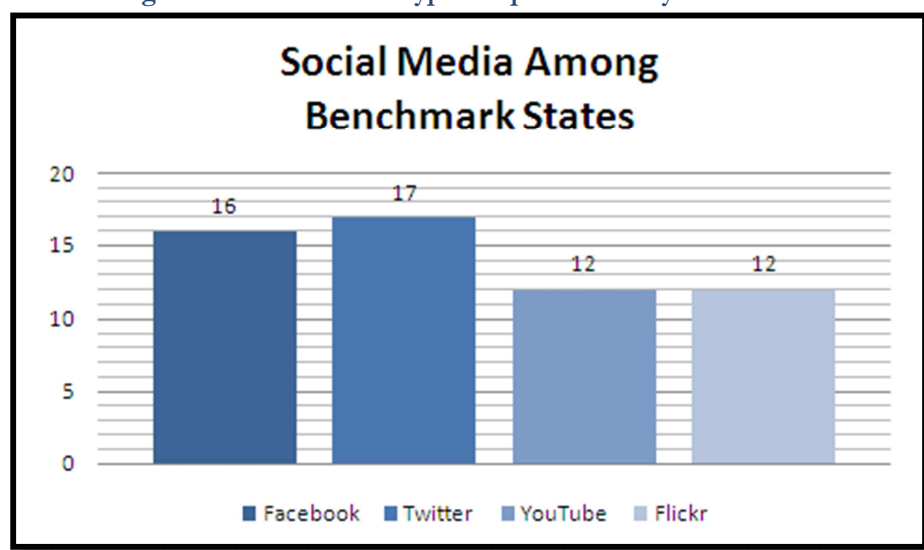
NASCIO found during a 2010 survey focused specifically on social media use among state governments that citizen engagement is the primary reason states use social media. Public information/outreach/awareness objectives and open government objectives are the next most prevalent reasons. [lvii] Approximately one half of state CIO organizations and about 67% of other state agencies reported actively using social media tools in NASCIO's 2010 general survey of state CIOs. This survey also revealed that only about one fourth of states had developed a statewide policy to govern social media use and some state attorney generals have prohibited the use of certain types of social media based on legal concerns. [lviii] The table below provides sources of existing policy models within the states.[lix]

Figure 9: Links to State Social Media Policies and Standards

California	http://www.cio.ca.gov/Government/IT_Policy/ITPL.html	Policy
	http://www.cio.ca.gov/Government/IT_Policy/pdf/simm_66b.pdf	Standard
Delaware	http://dti.delaware.gov/pdfs/pp/SocialMediaPolicy.pdf	Policy
Indiana	http://www.in.gov/ai/appfiles/requests/doc/social%20media.pdf	Policy
	http://www.in.gov/inwp/2460.htm	Request form
Maine	http://www.maine.gov/oit/policies/socialmediapolicyfinal.htm	Policy
Maryland	http://doit.maryland.gov/WebCom/Pages/smtemplate.aspx	
Massachusetts	http://www.mass.gov/?pageID=afsubtopic&L=6&L0=Home&L1=Research+%26+Technology&L2=Information+Technology+Services+%26+Support&L3=Application+Services&L4=Mass.Gov&L5=Social+Media+Guidance+%26+Best+Practices&sid=Eoaf	Guidance and Best Practice
New York	http://www.empire-20.ny.gov	Guidance and Best Practice
North Carolina	http://www.records.ncdcr.gov/guides/best_practices_socialmedia_usage_20091217.pdf	Policy[7]
Oklahoma	http://www.ok.gov/OSF/Information_Services/Social_Media/	Policy
Texas	http://www.texas.gov/en/about/Pages/social-media-policy.aspx	Policy
Utah	http://www.utahta.wikispaces.net/file/view/State%20of%20Utah%20Social%20Media%20Guidelines%209.22.09.pdf	Guideline

Finding 33: Nine of the twenty states (45%) analyzed provide enterprise level collaboration tools.

Collaboration suites such as SharePoint have become popular management tools within IT organizations. The user-friendly format of these applications make them effective among non-technical business users managing projects and/or organizations. In a survey of 100 businesses with a total of 347,448 users worldwide, the Radicati Group found that 36% of organizations surveyed currently deploy SharePoint and that 23% of the remaining respondents planned to deploy SharePoint within the year. The Radicati Group also found that organizations that use SharePoint do so for many reasons but document management and collaboration are the most prevalent uses.[lx] To prevent a myriad of distributed SharePoint implementations cropping up across the state, several state IT organizations offer enterprise SharePoint as a service.

2.2.4 Enterprise Information Management (Analytics, Geospatial, Graphics, Imaging, and Healthcare)

Finding 34: Twelve of the twenty states (60%) analyzed have implemented or are implementing business intelligence systems.

Indiana: The Indiana Office of Technology (IOT) is implementing Oracle's OBIEE tool. OBIEE was selected by IOT partially based upon its ability to integrate with PeopleSoft, the HR and Financial Management tool suite selected by Indiana as the state-wide standard.

Finding 35: Fourteen of the twenty states (70%) analyzed provide enterprise GIS systems.

Colorado: Several Colorado agencies have a GIS system; Colorado is also planning to implement an enterprise GIS with two components: public-facing services and state government services.[lxi]

Montana: Montana's state library manages the web portal that provides front end access to state GIS data. Montana's GIS solution supports 14 million Internet requests and almost

500G of data coming into and out of the network each month with requests for Web mapping services and cadastral information being the most frequent.[lxii]

Oregon: Oregon's Geospatial Enterprise Office manages a geospatial data clearinghouse and spatial data library. GEO manages 4 terabytes of geospatial data for Oregon's GIS community. That number is expected to grow to nearly 15 terabytes of stored geospatial data in the next few years.[lxiii]

Utah: Utah's Automated Geographic Reference Center (part of the state's Department of Administrative Services [DOA]), manages the State Geographic Information Database. [lxiv]

Indiana: Indiana's first strategic GIS plan was developed in 2008. Subsequently, data sharing agreements were negotiated with county government organizations, and hardware/software investments were consolidated to reduce costs. Eventually, at least thirteen separate entities collaborated to support Indiana's enterprise GIS system. These entities ranged from the United States Geological Survey (USGS) to the Indiana Department of Transportation to the State GIS Center of Excellence (CoE) to the State Library.[lxv]

Finding 36: States are implementing electronic payment tools to cut costs and expedite state payments.

One organization found that "on average, governments spend $2 per check in printing and mailing costs…. The state of North Carolina saved $4 million by delivering unemployment benefits via EPC [Electronic Payment Cards] in its first year. More than 20 other states are saving millions by adopting EPC [electronic payment cards] for a variety of programs."[lxvi]

Finding 37: States vary in their response to the mandates of the Patient Protection and Affordable Care Act. [lxvii]

- **As of May 2011 six states have enacted health insurance exchanges (two of these six systems pre-date the mandate).**
- **Several states are launching their compliance initiatives via establishment of committees tasked with researching requirements and presenting recommendations.**
- **At least 41 states have opposed at least some part of the mandate or suggested alternative means of fulfillment.**
- **Three states to date have passed legislation to support the PPACA requirements: California, West Virginia and Maryland.**

California: California was the first state to pass legislation defining the state's approach to the PPACA. Governance of the California exchange will be managed by a five person, independent board appointed by the Governor and legislature. Board members will be required to have demonstrated expertise and will be subject to conflicts of interest rules. Each member will serve one year on a volunteer (unpaid) basis only.[lxviii]

Massachusetts: As one of the few states with an exchange already implemented, Massachusetts' "Connector" exchange provides a good example of costs for other states. "Connector"

exchange costs total approximately 4% of average premiums with around 187,000 citizens enrolled. [lxix]

Finding 38: Fulfilling PPACA requirements may entail both new technology investments and process re-engineering. [lxx]

The core requirements of the PPACA are easily attainable by most states:
- Provide plan information (e.g., plan pricing, quality ratings, benefits) via a web portal
- Establish and operate a toll-free hotline

In addition to these core requirements, PPACA will require that real-time eligibility decisions be presented online for enrollees including those in unique and fluid situations (e.g., families relocating, families with fluctuating annual incomes, etc.) Eligibility determinations must take into account Medicaid, CHIP and exchange requirements as well as basic identification information such as citizenship and income levels. Current state healthcare eligibility platforms are typically county-based rather than state-wide and tied to tedious welfare-eligibility processes. To meet the required mandates, integration between multiple data systems (including modernization of legacy applications) may be required and new state-wide eligibility parameters may have to be implemented.

Finding 39: HIPAA and NIEM standards provide a platform for more easily integrating required systems.

The U.S. Department of Health and Human Services Secretary has recommended the implementation of NIEM guidelines "to develop, disseminate and support standards and processes that enable the consistent, efficient and transparent exchange of data elements between programs and States." HHS also encourages states to "express business rules using a consistent, technology-neutral standard format, congruent with the core data elements identified through the NIEM process." And to use "existing Health Insurance Portability and Accountability Act (HIPAA) adopted transaction standards…to facilitate transfer of consumer eligibility, enrollment, and disenrollment information between Affordable Care Act health insurance coverage options (including Medicaid and CHIP), public/private health plans and other health and human service programs." [lxxi]   Ten of the twenty states analyzed in this study have adopted the NIEM standard, paving the way for meeting PPACA standards. (See Finding 40 below.)

Finding 40: PPACA requirements are a prime opportunity to drive multi-state collaboration. [lxxii]

Since states are required to cover operational costs via enrollee fees, some states which anticipate lower enrollment numbers may consider collaborating with other states in developing regional exchanges. The adoption of NIEM data standards within many states will greatly enhance states' abilities to collaborate across state lines.

Note: See *The Patient Protection and Affordable Care Act: Current Status and Implications for the State of Hawai`i* report delivered July 22, 2011 for more information about the PPACA.

2.2.4 Enterprise Application Environments (Enterprise Application, Enterprise Application Interaction & Integration, Mobile Applications)

Finding 41: Seventeen of the twenty states (85%) analyzed have implemented mobile applications.

States have found that creating mobile applications is a relativity quick method of enhancing state employee and citizen access to key state data. The figure below provides an overview of the most frequently occurring types of mobile applications within the benchmarked states.

**Figure 10: Mobile Application Types Implemented Among Benchmark States**
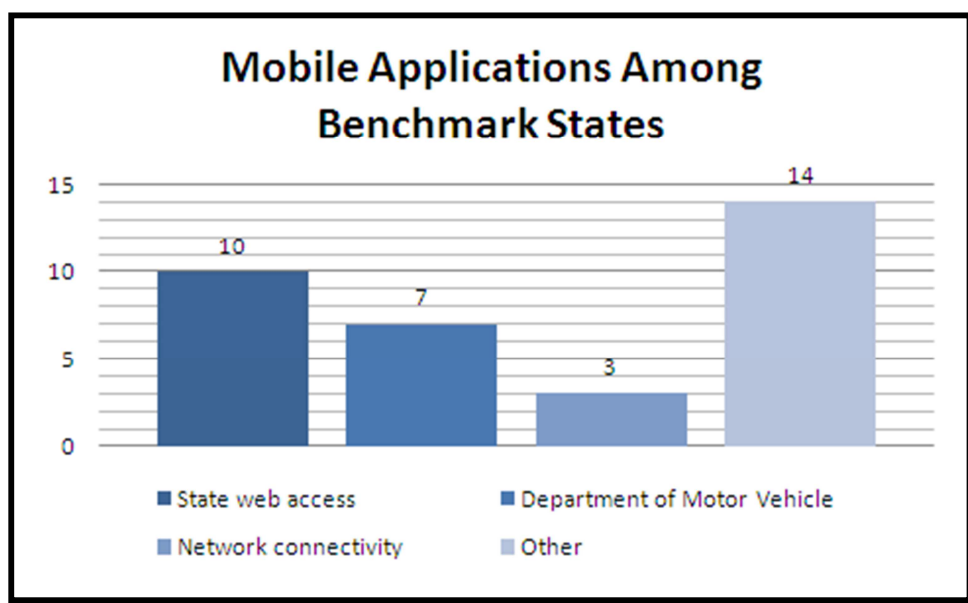
Finding 42: States have found that syncing multiple types of mobile devices (e.g., Blackberry's , etc.) with the state email system can be a challenge.

Montana: The State Information Technology Services Division (SITSD) implemented "ActiveSync" to allow all mobile devices to send/receive state email.

Finding 43: As states consider consolidation and centralization of services, legacy system modernization has emerged as potential area of cost saving and increasingly a key risk mitigator.

State legacy systems have come to represent an area of significant risk. A 2008 NASCIO survey of state CIO's revealed that most states classify 50% of state systems as legacy systems and 50% of legacy systems as supporting critical lines of business. Those identified as presenting the greatest challenges were ERP systems and siloed systems used to manage federal programs. The figure below illustrates the lines of business in which most state legacy systems are located. These responses were provided as part of NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States.[lxxiii]

Figure 11: Business Areas and Legacy Systems Locations
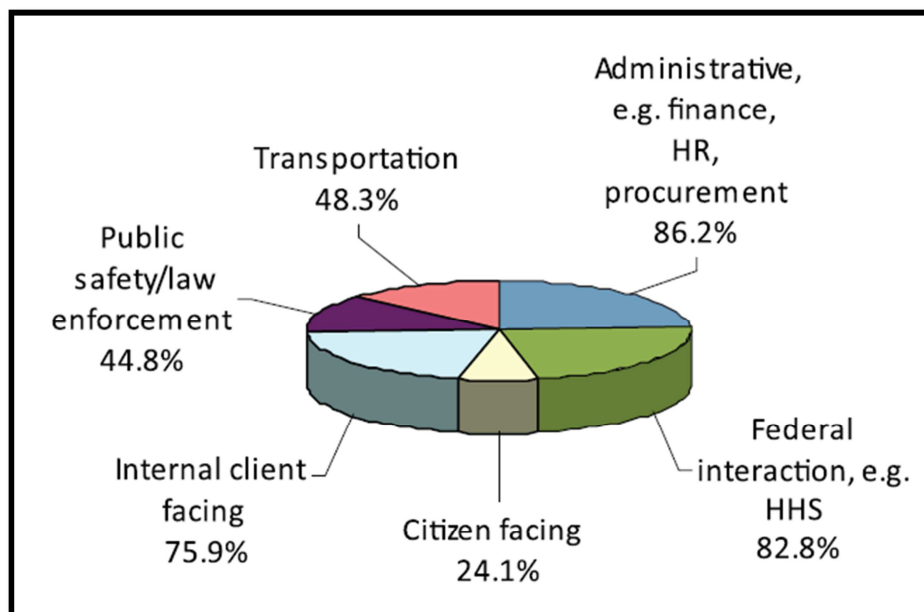
The "graying" of the state IT workforce looms large on the 3-8 year horizon as a specific risk given the high number of legacy applications. Approximately one fourth of state CIO's predict that up to 30% of state IT employees are approaching retirement within the next five years. The greatest risk this poses is in the inherit drain of institutional knowledge particularly of antiquated systems and applications. While states have been given a temporary reprieve due to 52.4% of state employees choosing to work beyond retirement age because of the recession, this is only a temporary fix.

> "[We use] IT enterprise portfolio management to look at all IT investments, whereas IT application portfolio management looks only at IT applications and what dollars are being spent modernizing systems or supporting systems. Our biggest opportunity is supporting both. Enterprise portfolio management looks at where dollars are spent, but the largest opportunity is from IT application portfolio management. Typically, when states have budget cuts they kill the new stuff, but investment management tries to reverse this and asks if we can achieve overall higher cost savings if we stop enhancing legacy systems and instead modernize. For example, we had a $1 million eligibility project. When we first looked at it, the effort had 47 projects that would require enhancing legacy systems. We asked, instead of enhancing them, what would the costs and benefits be of modernizing these legacy systems? We knocked out 43 of 47 projects after we decided to modernize versus enhance." *CIO Respondent to the 2010 State CIO Survey*

Additionally, many technologies used in legacy systems are no longer supported by vendors.[lxxiv]

States are using various methods to address these risks. For short-term fixes, some states are contracting with former state employees to perform specific tasks based on their knowledge of legacy systems.[lxxv]   Application portfolio management processes are helping inform longer-term decisions by helping states inventory legacy systems and define end-of-life plans.

North Carolina: North Carolina implemented an applications portfolio management tool which allows them to maintain an accurate inventory of applications, analyze each application within the context of the entire portfolio considering such criteria as cost, performance, risk, etc., and develop end-of-life planning scenarios. [lxxvi]

Working with vendors for 'no cost' proofs of concept has also helped inform the modernization decision process. Once it is determined that a new solution must be defined for a legacy system, states are taking multiple approaches to address this issue. The figure below lists some of these approaches.

Figure 12: State Approaches to Modernizing Legacy Systems

Modernization Methods	Timing – Used in the Past/Currently Using	Experience – Used/ Using Successfully
Data conversion	90.9% (N = 22)	100.0% (N = 19)
Extension	90.5% (N = 21)	100.0% (N = 17)
Virtualization/ Emulation	82.6% (N = 23)	94.1% (N = 17)
Re-engineer or replace with a COTS software	82.1% (N = 28)	91.3% (N = 23)
Applications wrapping	81.8% (N = 22)	70.0% (N = 20)
Re-hosting/ Re-platforming	80.0% (N = 25)	89.5% (N = 19)
Automated migration	73.3% (N = 15)	81.8% (N = 11)
Renovation/ Re-architecting	72.0% (N = 25)	87.5% (N = 16)
* Utilize EAI to encapsulate and link legacy applications	57.9% (N = 19)	90.9% (N = 11)
* SOA integration	46.1% (N = 26)	84.6% (N = 13)

Source: NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States

* = Highest percentage reported of planning to use in the future: (1) SOA integration, 53.8% (N=26); (2) Utilize EAI to encapsulate and link legacy applications, 42.1% (N=19).

Colorado: Legacy system modernization is considered one of the most (if not the most) critical IT issues in the State of Colorado. The Colorado Office of Information Technology (OIT) assessed several legacy systems across multiple executive agencies in 2009 and ascertained that due to budget constraints limiting system modernization efforts the average age of legacy systems was ten years. Overall, 58% were at least seven years old, seventy-seven were 15+ years old, and one system was over 40 years old. Only 9% were less than seven years old. With almost forty percent of Colorado's workforce due to retire by 2016 (representing a major drain of institutional knowledge) and vendor technical support no longer available for legacy system software, these legacy apps present a significant risk. Colorado has made modernization of thirty-four of these systems a key component of their enterprise-wide transformation initiative.

West Virginia: West Virginia's application development, maintenance, and support activities are highly distributed. Currently there are over 500 legacy applications utilizing over 70 languages and 40 unique database tools, costing the state over $35 million annually and being supported by more than 300 FTE's and 60 contractors in 31 agencies. Several of these applications are 15+ years old; vendor technical support is no longer available for the obsolete technologies. This fragmentation has resulted in limited standards and weak continuity of operation and disaster recovery strategies.   As result, enhancing the enterprise applications development environment is one of the four key focus areas for West Virginia OT during the 2010-2013 period. West Virginia's ERP implementation will replace approximately 100 of these systems.

Kentucky: Every two years, each agency is required to submit end-of-life replacement plans for legacy systems and designate the basis for the plan (i.e., prohibitive maintenance costs, etc.)

Indiana: An annual evaluation of risk is performed including an analysis of legacy applications; results are reported to the legislature.

Virginia: Virginia developed public-private partnerships to reduce initial costs and mitigate the top obstacle states face in regards to modernization efforts: funding. Virginia also established an enterprise application program office focused on modernizing legacy applications. Virginia has also considered SaaS solutions to mitigate the requirement of a large modernization investment.

Montana: Montana has adopted the federal Methodology for Business Transformation (MDT) toolkit.

Finding 44: Nine of the twenty states (45%) analyzed have implemented service oriented architecture (SOA).

Along with Enterprise Application Integration (EAI) and Virtualization, SOA is the leading solution states planned to use to modernize legacy systems in the future.[lxxvii]

Finding 45: Fourteen of the twenty states (70%) benchmarked in this study have implemented some level of disaster recovery plan.

Disaster recovery plans vary greatly by state; the degree of enterprise-wide disaster planning is linked to the level of consolidation and centralization within the enterprise. For example, Montana's state agencies have ranked the criticality of applications; only 28% of those ranked as "critical" have a DR plan. As data center consolidation, virtualization and cloud computing become prevalent, disaster recovery planning efforts will continue to grow.

West Virginia: Construction of a second data center was planned to provide a hot or cold site for disaster recovery.

Finding 46: Ten of the twenty states analyzed (50%) share data (or are actively planning to) via enterprise systems (e.g., ERP, etc.).

West Virginia: During 2010, West Virginia began the initial stages of an Enterprise Resource Planning (ERP) implementation. It is anticipated that this initiative, more than any other, will transform the state's business processes, replacing approximately 100 of the state's existing legacy applications either completely or partially.

Finding 47: A few states are taking a broader approach to information sharing.

Overall: Ten of the twenty states (50%) analyzed have adopted the NASCIO recommended National Information Exchange Model (NIEM) data standard to support data integration and standardization across the state enterprise and between state and federal organizations.

Colorado: The Government Data Advisory Board (GDAB), one of very few Boards in any state in the country to provide a central governing structure for enterprise data sharing initiatives, was seated in August 2009 and is chaired by the State Chief Data Officer.

3.0 CONCLUSION

The majority of state government organizations are pursuing technology consolidation and centralization as a solution to the fiscal pressures imposed by the recession.   While funding reductions are motivating these changes, many states expect to achieve significant performance improvements as well.

With so many consolidation efforts across the nation well underway or completed and the cloud environment becoming more mature, State of Hawai`i is an excellent position to benefit from lessons learned by other state government IT organizations and thereby to avoid common pitfalls. State of Hawai`i is also well positioned to capitalize on low-entry-cost technologies such as cloud computing to achieve significant cost savings and performance standardization and improvement.

APPENDIX A: STATE CONSOLIDATION/CENTRALIZATION APPROACHES OF NOTE

Indiana	
Directive	Executive order.[lxxviii]
Centralized staff	Yes. Enterprise staff only; application development staff report to agency CIO's.
Phased centralization	Yes. The CIO located the strongest agency-based IT organization in the state, built on their strengths and then began the centralization by transitioning several 'key' staff from this and other agencies to IOT to manage the consolidated infrastructure services IOT would offer. He also recruited staff from the private sector.
Phases	- IT Consolidation Agency Executive Summary - Technical Kickoff Meeting - Phase 1 - Agency IT Assessment, Technical Assessment Review, Project Assessment Review, Deliverables - Phase 2 - Consolidation Implementation - Phase 3 - Consolidation Review[lxxix]
Length of effort	N/A
Savings/ benefits	The creation of IOT resulted in core IT services for all 70 agencies (28,000 end users) being centrally managed for a savings of $14 million annually. In addition to $14 million in annual savings, Indiana's technology consolidation has also funded the replacement of all 28,000 PC's on a four year schedule. IT contract consolidation resulted in $20+ million in savings.[lxxx]
Other	Prior to 2005, IT in Indiana was managed by each agency. The Department of Administration (DOA) provided some centralized IT support but since agencies were not required to use DOA services, only 900 of the 28,000 users within the state were supported by DOA. *BP* By executive order in 2005, Indiana appointed a CIO, created the Indiana Office of Technology (IOT) and consolidated IT infrastructure (network, email, payroll, help desk, purchasing, human resources, data center maintenance) under this new office. To achieve this consolidated shared services model, the newly appointed CIO pursued the following: - transition oversight/management – Indiana established three project teams, one focused on consolidation (project plan, templates, HR, etc.), one focused on service excellence (best practices, security policy, customer satisfaction training, etc.), and one focused on shared services (service/cost definition, vendor contract consolidation.)[lxxxi] - standardized technology – Standardizing on Microsoft Outlook as the email tool for all 28,000 users was one of the initial technology standardization efforts of IOT. Indiana moved from 107 agency email

servers to 6 statewide servers. **BP** The success of Indiana's email consolidation process was partially dependant upon the establishment of agreements between IOT and each agency regarding their specific support needs (e.g., the Indiana Bureau of Motor Vehicles was open on Saturday and closed on Monday; the Indiana State Police needed special support that differed from all other agencies, etc.). IOT then tracked email performance against these specific agreements. "We did this (email consolidation) carefully because we knew if we had one failure, people would want to back off. We never did have a failure", said Gerry Weaver, Indiana CIO and Head of the Indiana Office of Technology.

- data center consolidation - IOT consolidated Indiana's five data centers into one reducing Indiana's 3,000 servers to 2,000 via email consolidation and virtualization.

- centralized end user support – The move to a state-wide help desk resulted in lower customer satisfaction scores for a few months; by the end of the first year, customer sat scores were higher than prior to the centralization.[lxxxii] Additionally, by implementing Intel's vPro remote-management function on 7000+ PCs, an estimated 80% of desk-side visits were eliminated, saving Indiana an estimated $170K in the first year of implementation.[lxxxiii]

- energy management – in addition to data center consolidation, IOT deployed Intel's vPro technology to automatically shut down state PC's at night saving $400,000 annually in electric bills.

"We'd be glad to share anything with any states that are approaching this regarding the templates we used, the processes we used and the way we set up the billing mechanisms." *Gerry Weaver, Indiana CIO and Head of the Indiana Office of Technology*

West Virginia	
Directive	Governor supported effort by CTO to gain buy-in agency by agency.[lxxxiv]
Centralized staff	Yes.
Phased centralization	Yes. Centralization began in 2007 with two agencies; all civil service agencies were consolidated by May 2010.
Phases	Agency by agency.
Length of effort	Approximately three years.
Savings/ benefits	Since 2005, IT expenditures (excluding labor) declined by approximately 17%. Staffing levels have declined by over 12%.
Other	Between 2001 and 2005, IT related costs grew 6% annually in West Virginia. Upon appointment in 2005, the new Chief Technology Officer (CTO) and the Office of Technology were tasked with assessing the existing technology environment. The CTO and OT recommended that West Virginia's entire technical infrastructure and IT-related staff positions be consolidated/ centralized within OT. While supporting the recommendation, in lieu of imposing the change via executive order or legislation, the governor tasked the CTO with gaining buy-in among cabinet secretaries via promoting the benefits of consolidation to each organization specifically. *BP* To achieve this buy-in, OT established memorandums of understanding (MOUs) and service level agreements (SLAs) with each agency to govern the relationship between OT and agencies. OT currently offers 30+ services for nearly 20,000 employees at over 1,000 locations. The following were key to the success of West Virginia's consolidation initiative: • managed desktop – all desktops are procured from a single vendor who applies the state's standard image (or custom upon request). • energy management – OT implemented a power management system to automatically shut down state PC's at night. Initial implementation resulted in savings of approximately $250K annually in electric bills. Upon full implementation, savings are expected to be $500K annually. • centralized support – by forming the centralized service desk from IT support staff formerly located in each agency, the centralized desk immediately inherited a wealth of institutional knowledge regarding each agencies' needs. • standardized technology – OT implemented a centralized email system in 2007 and transitioned agencies to the new system as they were migrated to the managed, standard desktop environment. Approximately 17,000 of 20,000 were migrated by September 2010. OT also created the WV.gov network domain and migrated 75 unique agency domains to WV.gov. Each migration required OT to map old systems to the new domain. The manual account provisioning process was labor

	intensive; upon completion of the migration, OT anticipated automating the provisioning process. • self-funded portal – ^{BP} In 2007 OT formed a public-private partnership with a local subsidiary of NIC, Inc., to maintain the state's web portal including adding interactive online transaction services to the site. NIC invested the initial capital and OT allows NIC to earn a reasonable return through selective transaction fees assessed to users of some online portal services (e.g., NIC serves as the sole point of electronic access to the Division of Motor Vehicles' [DMV's] motor vehicle records). NIC has deployed this "self-funded" model in 20 other states (including Hawai`i), delivering efficiencies without expenditure of appropriated funds. WV.GOV has matured into an efficient, effective and user-friendly statewide intranet, internet, and extranet portal.

Michigan	
Directive	Executive order.
Centralized staff	Yes.
Phased centralization	No. All staff and services moved under authority of CIO on one day. Michigan recommends a phased approach for other states and standardization prior to centralization.
Phases	• Centralization • Data Center Consolidation • Standardization and consolidation
Length of effort	Moved 400 people in the first year.[lxxxv] Standardization and consolidation still ongoing.
Savings/ benefits	Michigan's IT workforce shrunk from 2,300 employees/2,300 contractors in 2002 to 1,700 employees/800 contractors in 2011. Information technology is more closely tied to agency needs. Between 2002 and 2008, savings totaled approximately $100 million (24%).[lxxxvi]
Other	The State of Michigan was the first state in the nation to consolidate and centralize technology services. In 2001 the Department of Information Technology (DIT) was formed by executive order. Upon being launched in 2002, DIT consolidated 19 IT organizations and 2,300 employees. Additional activities include: • central IT platform – Initiated in 2007, the Michigan One initiative was designed to standardize file and print services, desktop installations, and security. All 55,000 desktops and 900 applications were to be transitioned to the new platform by 2010. Server reduction anticipated (2,612 to 670. [lxxxvii] • data center consolidation – Consolidated 36 data centers into 3. • technology standardization – Seventy disparate email systems transitioned into two.[lxxxviii] Due to the success of Michigan's technology centralization/consolidation effort, DIT is now part of the Department of Technology, Management and Budget and the CIO has been tasked with applying centralization/consolidation principles to other administrative areas of the state (e.g., state facility management, etc.) to achieve savings beyond the technology space.[lxxxix]

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Utah	
Directive	Legislative mandate.
Centralized staff	Yes. 900+ staff from 24 agencies were transitioned into the Department of Technology Services under the purview of the CIO.
Phased centralization	Authorized in March 2006, all IT staff transferred to DTS in July 2006 and DTS began collecting fees from state agencies. Data center consolidation January 2009 – June 2010.
Length of effort	Approximately 3 years.
Savings/ benefits	From FY 2007 to FY 2010 has achieved a cost savings of $26.55 million. By managing to SLA's, DTS' customer satisfaction ratings in 2010 averaged 4.61 on a scale of 1 to 5. Utah as also the first state in the country to win the Center for Digital Government's Best of the Web award in consecutive eligible years.[xc] Since inception, FTE counts have been reduced by 148 (19.3%). Managed attrition has saved DTS $14.8 million and covered employee compensation increases totaling $15.9 million for the same period. From FY 2007 to FY 2010 has achieved a cost savings of $26.55 million. Rural enterprise IT support has reduced travel costs approximately 20%[xci].
Other	Utah's centralization/consolidation effort began with a legislative mandate in 2005. Anticipating full consolidation by mid-2006, the mandate established the Department of Technology Services (DTS) and required the appointment of a CIO. To launch this initiative, DTS began with audit of assets and resources and centralization of staff. Additional activities included: • oversight – *BP* A DTS Transition Advisory Council (DTAC) was formed comprised of senior department managers and several agency IT Service Directors. DTAC works with each agency to ensure business needs are met and present/review optimization opportunities via the established IT investment review process. The Technology Advisory Board, comprised of private sector, educational and government members also provides guidance. • enterprise planning – In 2006, DTS began developing Strategic and Annual IT Plans. The first IT Strategic Plan was delivered to the legislature in 2006. Plan development involves key stakeholders; business leaders identify and discuss business needs and areas of potential collaboration; DTS reviews, recommends optimizations and estimates costs; business leaders and DTS jointly fund and launch the initiatives. • managed desktop – prior to 2005, Utah had 369 "standard" desktop configurations and 22 versions of word processing software in use. DTS standardized on a state-wide desktop image and saved $3.5 million annually on desktop purchases by accessing the Western States

Contracting Alliance (WSCA).
- data center/server consolidation – DTS consolidated 35 data centers into 2 over eighteen months saving $4 million annually, reducing servers from 1864 to 591, and providing enhanced security and performance. One example of performance enhancements achieved via consolidation/virtualization is a 60% performance gain on a regular batch job within the Department of Workforce Services. Another: total runtime for state-wide payroll decreased to 3.5 hours from 39 and provided a cost avoidance of $300K in hardware needs.[xcii] For more details on this initiative and lessons learned see http://www.cio.gov/documents/Utah-data-consolidation.pdf and http://dts.utah.gov/architecture/datacenterconsolidation/documents/DTSDataCenterConsolFinalReport.pdf
- centralized support – DTS consolidated 22 separate agency-based help desks into one centralized support team.[xciii]
- online services – With DTS leadership, the number of online services in Utah grew from 200 in 2004 to over 900 in 2010. Utah.gov receives more visitors per capita than any government website in the U.S. and more unique monthly visits than Colorado, Arizona, Nevada and Idaho combined.
- customer focus – Emphasized communications via a formal communications plan including scheduled email newsletter updates. DTS designated 24 Agency IT Service Directors who serve as the liaisons between DTS and the agencies. DTS also created service level agreements and manage performance to these agreements.[xciv]

DTS supports over 22,000 network connected devices, over 1 million emails per business day, 500+ servers, over 20,000 desktops, 890+ business applications, and 14,600 service requests per month.[xcv] In 2007 and 2008, DTS operated on a net negative income due to start-up costs and unfunded employee compensation. By FY2009, DTS was operating with a net positive income and purposely used extra funds to pay for new projects, investments and to prevent raising service rates.

Maturation of the technology environment continues:
- Email – DTS is currently pursuing a cloud-based email service to replace the existing, end-of-life system. Once a contract is in place, DTS plans to offer use of this system to city and county governments and educational institutions.[xcvi]
- Mainframe – DTS has mandated that legacy applications be retired from the mainframe by 2013.
- Desktop virtualization – Planned for 2010-2013.
- Enterprise Planning – Four communities of interest have been formed (government operations, social services, public services, regulatory services) and each state agency assigned to at least one. These communities are tasked by the Governor's office with identifying

	programs and data that can serve multiple agencies. DTS serves as a facilitator and 'optimization consultant' to help each community reach its goal. [xcvii]

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